PROTON-CONDUCTING CERAMICS/POLYMER COMPOSITE MEMBRANE FOR THE TEMPERATURE RANGE UP TO 300 DEG C

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Inventor: KERRES JOCHEN (DE); NICOLOSO NORBERT (DE)
Applicant: UNIV STUTTGART INST FUER PHYSI (DE); KERRES JOCHEN (DE); NICOLOSO NORBERT (DE)
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Abstract of **WO0077080**

The invention relates to a composite membrane that consists of organic functional polymers and ceramic nanoparticles (1 - 100 nm), except for phyllosilicates and tectosilicates, with intercalating water and/or a high surface concentration in acidic/alkaline groups (for example hydroxyl) and water. The use of such particles allows a sufficiently high mechanical stability of the composite material and a stabilization of the proton concentration in the membrane that is necessary for the conductivity up to an operating temperature of 300 DEG C. The inventive composite material is characterized by the interfaces that are formed in the microheterogeneous mixture between the polymer and the ceramic powder. Said interfaces, if formed in a sufficiently high quantity (high phase share of nanoscale particles) allow a transport of the protons at a low pressure and at temperatures of more than 100 DEG C. If the polymer/ceramic particle boundary layer is modified by means of boundary groups that have different polarities, preferably at the polymer skeleton, the local establishment of equilibrium and thus the binding strength of the proton charge carriers is influenced. This effect can be used, for example for alcohol/water mixtures as a fuel, to reduce the MeOH passage (Me = CH3, C2H5, C3H7, ...) across the membrane, which is especially important for the development of efficient direct methanol fuel cells. In addition to its use in fuel cells, the inventive membrane can also be used in the field of energy and process technology, in which water vapor is produced or required in addition to electric current or in which (electro)chemically catalyzed reactions are carried out at increased temperatures at a pressure that ranges from the atmospheric pressure to elevated working pressures or that are carried out in a water vapor atmosphere. The invention further relates to a method for producing and processing such a composite membrane.